REMARKS

Reconsideration of this application is respectfully requested. No amendments to the claims or application are proposed in this response.

The rejection of claims 1 to 3, 6, 10 to 12, 24 to 26, 28, 33, 34 and 37 as being obvious over Muller (Patent Publication 2002/0070729) in view of U.S. Patent 4,058,765 (Richardson et al) is traversed.

The withdrawal of the anticipation rejection based on Muller is appreciated.

Claims 1, 10, 24 and 28 are independent. These claims require a magnitude of a gap (or width of a medium) be determined by the claimed non-contact sensor.

Muller does not measure the magnitude of a gap and does not apply a sensor signal to control the gain of an amplifier. The Muller proximity sensor detects a trigger event which may be when the sensor is proximate to a surface. Muller, paras. 0025, 0028. The Muller proximity sensor produces an output that switches when the target is close to the sensor. Muller does not determine the magnitude of the displacement between the sensor and the target.

The Richardson et al and Muller circuits measure two capacitances and take the difference between the two capacitance measurements. In contrast, the circuit disclosed in this application senses one capacitance by using a measurement based on the changing gain of the op-amp using an AC voltage. The is no suggestion in the Richardson et al or Muller to substitute the Richardson circuit for the Muller circuit or to combine the references to form the claimed invention.

I. Independent Claims 1, 10, 24 and 28:

The independent claims define a method for non-contact measurement in that measures changes to a single capacitance. In particular, these claims require: "applying the high frequency signal and a signal from a sensor plate of the conductive plates to control a voltage gain of an amplifier in the circuit, said signal from the sensor plate being indicative of the displacement between the sensor and the surface." The high frequency signal is an input applied to the plates. The claims require applying the high frequency signal and "a signal from the sensor plate" to control a voltage gain of an amplifier. The claims further require "differentiating an output of the amplifier and the high frequency signal." In the claimed system, there is no need for two output signals because the system uses a signal output signal indicative of a capacitance across a gap and the input signal to measure the gap displacement.

Muller does not disclose applying a signal from a sensor plate and an input signal to control the gain of an amplifier. Muller applies output signals from two coils 3, 4 to the inputs of a differential amplifier 5. Muller does not control the gain of an amplifier. Muller senses the amount of signal which is capacitively coupled onto a measurement plate. Capacitance between the measurement plate and the target material reduces the coupled signal amplitude which is measured by an operational amplifier (op amp) Muller para. 0031. Muller does not suggest controlling the gain of the amplifier with the output signals of either coil or combining an input signal and an output signal to control an amplifier.

The circuit disclosed in Richardson et al does differentiate the input signal and the output signal of the sensor plate. The circuit in Richardson et al applies a pulse train to two separate capacitances (C_1, C_6), and measures the difference in the charge being held by the two capacitors to determine if the capacitance of one capacitor has changed. Richardson, col. 3, lns. 45-58; col. 4, lns. 11-19. The circuit disclosed in Richardson et al compares the charge held by a sensing capacitor (C3) to the charge held by a reference capacitor C_6. Richardson, col. 4, lns. 20-24, 56. The difference in the charges held by the two capacitors is the signal indicating a general displacement. By disclosing a sensor capacitor and a reference capacitor system (C_1, C_6), Richardson et al teaches away from the system recited in claims 1 and 28 that rely on a signal output capacitance output signal to measure a displacement. Further Richardson et al does not suggest modifying the circuit disclosed in Muller to form the claimed invention.

There is no suggestion to combine Muller and Richardson et al to form the claimed invention. Muller and Richardson et al do not address the same problem in the same way that is accomplished by the invention. In particular, the invention addresses problems associated with signal noise generated by the electronics processing the sensor signal. See Spec. para. 0003. The invention addresses this problem by combining a single sensor signal with an input signal to control the gain of an amplifier. This approach avoids a reference signal and the associated electronics for processing a reference signal and comparing the reference signal to a sensor signal. Muller and Richardson et al compare a reference signal to a sensor signal and have electronics

associated with the reference signal. Accordingly, Muller and Richarson et al would appear to suffer the same signal noise problem addressed by the present invention and cannot be said to render obvious the solution provided by the present invention.

II. Patentability of Dependent Claims:

A. Claims 2 and 33:

The invention defined by claims 2 and 33 takes a difference between the output of an amplifier and a reference signal to strip off the reference signal from the measurement and reduce errors caused by changes in the reference signal. The output of the first amplifier is already indicative of the sensor gap. In particular, claims 2 and 33 require differentiating an output of an amplifier and a high frequency signal by "sensing a difference between a peak of the output of the amplifier and a peak of the high frequency signal." This feature is not taught by Muller or Richardson.

B. Claims 3 and 34:

Claims 3 and 34 require an amplifier that controls the signal on the sensor plate. The AC gain of the amplifier changes as a function of the capacitance between the measurement plate and the target providing an output voltage signal which is indicative of this capacitance. Claims 3 and 34 require: "controlling the gain further comprises applying the signal from the sensor plate and the high frequency signal as inputs to an operational amplifier."

Muller applies the signal from the sensor plate and the high frequency signal to an op amp which is used to take the difference between the two signals and obtain a

measurement. Richardson does not suggest retaining Muller's circuit to the extent it applies a high frequency circuit and adding an op amp.

C. Claims 6, 14 and 37:

Claims 6, 14 and 37 require:

> controlling the gain further comprises applying the signal from the sensor plate and the high frequency signal as inputs to an operational amplifier, and wherein differentiating further comprises **applying an output of the operational amplifier and the high frequency signal as inputs to a difference amplifier** which generates a cyclical difference signal indicative of the gap, and applying the cyclical difference signal to a peak detector which generates a signal indicative of a peak value of the cyclical signal, and wherein said peak value is indicative of the gap. (Emphasis added).

In the sensor embodiment disclosed in this application, an op amp controls the signal on the sensor plate so that there is minimal difference between the signal on the sensor plate and the oscillator driven plate. If there is no difference between these two signals, the sensor will not be sensitive to changes in the cable parameters due to temperature or other environmental conditions.

Muller applies a signal from the measurement plate and a reference signal to an op amp to generate a difference signal. This difference signal is the difference between the signal on the sensor plate and the oscillator driven reference plate. Muller does not teach applying the output of an op amp and the high frequency signal to a difference amplifier.

Richardson does not suggest keeping Muller's high frequency circuit and adding portions of its circuit.

The rejection of dependent claims 4, 5, 7 to 9, 13, 15 to 17, 27, 29 to 32, 35, 36 and 38 to 40 as being obvious over Muller and Richardson et al in view of Tardif et al (US Patent 6,307,385) is traversed.

These dependent claims should be allowed for the same reasons as stated above for their corresponding independent claims.

All claims are in good condition for allowance. If any small matter remains outstanding, the Examiner is requested to telephone applicants' attorney. Prompt reconsideration and allowance of this application is requested.

Respectfully submitted,

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